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ABSTRACT

The authors examine existing procedures and instruments used to assess the motor and perceptual/motor skills of severely/multiply handicapped infants and young children. Following an introductory section is a discussion of the rationale for the sequencing of assessment items and the limitations of the instruments for yielding specific quantitative data on the process of motor development in a severely/multiply handicapped individual. Following an introductory section is a review of instruments for qualitative measurement of motor development including the Learning Accomplishment Profile, the Marshalltown Project, Portage Project Checklist, Developmental Pinpoints, and Minimum Objective System for Pupils with Severe Handicaps. A second section focuses on quantitative measures of motor development. It is concluded from a review of research that although the initial attempts to develop quantifiable and continuous measurment procedures for assessing the motor acquisition of severely and multiply handicapped infants are promising, they are far too limited. (SBH)

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REVIEW OF SELECTED LITERATURE: ASSESSMENT OF MOTOR AND SENSORY/MOTOR SKILLS IN SEVERELY/MULTIPLY HANDICAPPED INFANTS AND YOUNG CHILDREN

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Introduction

The definition of early intervention has shifted in relation to chronological age. Intervention was once considered early if it was initiated with preschool children. The emphasis is now on the development of programs for high-risk infants and children starting as soon after birth as possible and continuing through the preschool years. Haring (1976) estimated that there were 200 to 300 infant programs at the time of his writing. This number is increasing rapidly. Consequently, assessment instruments, checklists, curriculum guides, etc., are now flooding a market that did not exist a few years ago. The application of this proliferation of evaluation strategies and instructional procedures to an established-risk population, (i.e., the severely/multiply handicapped) requires thoughtful analysis and careful investigation.

Certainly, successful assessment and intervention with severely/multiply handicapped infants and children may be the most complex technological and social endeavor presently faced by behavioral scientists in special education and human development. There is a national commitment to serve handicapped children in infant and preschool programs. Severely/multiply handicapped children have been assigned high priority. However, the current technology for serving these children lags far behind the commitment to provide services. We have witnessed (and continue to witness) the devastating effects when educational opportunities for severely/multiply handicapped individuals are lacking. Conversely, we

do not have adequate empirical data to substantiate the efficiency of current early intervention programs, nor do we have verified technology that can produce positive changes commensurate with our national commitment.

The assessment and educational programs for severely/multiply handicapped (SMH) children are complex because of the gross behavioral deficiencies manifested by these children in combination with impairment to their sensory and motor apparatuses. Accordingly, remediation programs for SMH children must teach skills in small, and logically sequenced increments while also making appropriate adjustments for sensory and motor defects that might significantly impede the learning process. Therefore, any attempt to assess or teach appropriate language, self-help, social interaction, and cognitive development skills must consider that the child may be visually or auditorally impaired, display grossly deficient motor skills, or have additional and complicating health related conditions (e.g., seizures, heart defects).

The assessment instruments and curriculum programs that have recently emerged for the severely/multiply handicapped population do not include a curriculum for severely/multiply handicapped preschool children that is accompanied by documented and convincing positive changes in social, perceptual, motor, behavioral, and cognitive development nor are assessment instruments and procedures adequate for recording changes or pinpointing areas for intervention. These observations are not intended as criticisms of existing intervention programs or existing assessment instruments. Many persons (ourselves included) respond to the need for

services for the severely/multiply handicapped without sufficient time or resources to validate the programs we develop. Unfortunately, the urgency to provide infant and preschool services to severely/multiply handicapped children combined with the absence of validated procedures may reinforce the pessimism that deterred development of these programs in the first place.

One possible problem in the early intervention efforts with severely/multiply handicapped children is that we attempt to accomplish too much with too little information or the wrong type of information. Too little information is reflected by the lack of sensitive assessment procedures and instruments to accurately pinpoint areas for intervention and measure the growth and development of severely/multiply handicapped infants and young children. (This point will be expanded in the review of assessment instruments for infants and young children and the utilization of these instruments with a severely/multiply handicapped population.)

Mira (1977) has addressed the problem of assessing and collecting the wrong type of information by pointing out that most assessment strategies have focused on at-risk infants where the primary concern has been the evaluation of cognitive constancy and the prediction of eventual cognitive functioning. Therefore, pre- and post-test scores or scores on global intelligence tests have been used without focusing attention on the processes involved or the course of development. Mira further points out that for the severely/multiply handicapped, we are, as Tjossem (1973) states, dealing with "established risk" infants.

> For these infants the intervention goal is not to produce normal children but to help them function at the top of the range determined by the disability. For these infants the program must center on those gross and fine motor skills culminating in purposeful use of the hands, postural control and ambulation. For these goals an evaluation methodology relying on cognitive function is not useful (p. 32).

Haring (1976) has also addressed the issue of early intervention programs for severely handicapped infants. His arguments closely correspond to the position of Mira that indicates that much of our present information gathering procedures are not relevant because we need intervention efforts that recognize the extent of damage to the central nervous system.

> When educators talk about infant intervention programs, they do not mean those essentially 'compensatory' programs in which a baby from a culturally disadvantaged environment is bombarded with 'enrichment' stimuli. Nor do they mean those infant programs that are merely extensions downward of day care programs offering primarily custodial or babysitting services. Rather, they are talking about programs that are conceptually far more complex and ambitious as they seek to remediate--or help the infant to overcome the effects of--insults far more sweeping than mere cultural deficit: prenatal, perinatal, and postnatal assaults on the central nervous system (p. 26).

Both Mira (1977) directly and Haring (1976) indirectly recognize that early intervention efforts for severely/multiply handicapped infants and young children must concentrate on information that will help identify deficiencies and developing basic motor skills.

The evolution of a number of child developmental assessment scales over the last four decades (e.g., The Gesell Developmental Scale, the Bayley, . . . etc.) has led to a tremendous expansion in the data base on normal child motor development. Several authors (Kral, 1972; Cromwell, 1963; Stein, 1964) have reviewed the general findings resulting from this

expanding data base. However, these reviews have not touched on the normative motor development of handicapped children under the age of six, although this is a critical period in any child's motor development.

Surprisingly, the normative data on the motor development of handicapped children six years or younger, encompasses only a handful of studies. In one such study, Kravitz and Boehm (1971) compared the emergence of rhythmic habit patterns (e.g., hand sucking, lip biting, body rocking, etc.) in normal, cerebral palsied, and Down's Syndrome infants and found marked delays in the onset of rhythmic patterns in the two groups of handicapped infants. Using the Gesell Developmental Scale, Dicks-Mireaux (1972) compared the motor development of Down's Syndrome to normal children ranging in age from 28 to 78 weeks. She found the Down's Syndrome children to be significantly retarded in their motor development compared to the normal children as early as 16 weeks of age.

In a descriptive study, Freedman and Cannady (1971) detailed the delay emergence of prone locomotion in seven developmentally delayed children. Adelson and Fraiberg (1974) compared the performance of 10 blind infants (who were otherwise normal) to normal infants on several standard assessments of gross motor development and found significant delays in self-initiated mobility and locomotion. In a study of 70 cerebral palsied infants and preschool children, Banham (1976) found that all the children, regardless of the exact nature of their cerebral palsy, were significantly delayed in their general motor development.

The sparse normative motor development data on young handicapped children suggest that delays and deficiencies in motor development may begin in infancy and continue to affect the child as he/she matures. However, this lack of normative data seriously limits the type of conclusions to be made concerning the influence of motor acquisition (or the lack thereof) on the subsequent progress of the child in related areas (i.e., social, language, and cognitive development.)

Any purposeful educational program for this population of infants and children must be predicated on basic and functional motor and perceptual/motor response repertoire. What is not so obvious is that the current technology for teaching these critical motor and perceptual/motor skills is almost as poorly developed as our current technology for precisely and accurately measuring the acquisition of motor and perceptual/motor skills in severely/multiply handicapped infants and children. The purpose of this review is to examine existing procedures and instruments used to assess the motor and perceptual/motor skills of severely/multiply handicapped infants and young children in order to define some procedures and techniques that should be used and developed further.

Qualitative Measurement of Motor Development in Infants and Young Children

This discussion of a representative sample of the more widely utilized assessment instruments specifically addresses the rationale for the sequencing of items and the limitations of the instruments for yielding specific quantitative data on the process of motor development in a severely/multiply handicapped individual. The focus on motor behavior was chosen as a key area because this population has a high incidence of moderate to severe motor impairment. In addition, basic or rudimentory motor skills are often prerequisites for skills in related areas of development, i.e., personal-social, communication, etc. For example, head and trunk control sufficient for independent sitting combined with coordinated movements in the upper extremeties increases the probability of developing self-help skills. Adequate respiratory capacity combined with the ability to coordinate movements of the lips, tongue, and jaw necessary for feeding increases the probability of developing articulation and phonation skills.

The sample of non-standardized assessment instruments selected for discussion include the following: Learning Accomplishment Profile (Sanford, 1975), the Marshalltown Project (Kiesler, Donahue, Montomery, Roecker, & Smith, Note 1), Portage Project Checklist (Shearer, Billingsley, Frohman, Hilliard, Johnson, & Shearer, Note 2), Developmental Pinpoints (Cohen, Gross, & Haring, 1976) and Minimum Objective System for Pupils with Severe Handicaps (Williams & Fox, Note 3). Each of these instruments follows a normal motor development model.

A sequence is inherent in the majority of these instruments (i.e., the mastery of certain skills are necessary for the development of future skills. This sequence as it relates to the motor area is primarily Gesell's [Gesell, Thompson, & Armatruda, 1934]). The sequence and rate of development proposed by Gesell et al. (1934) and later expanded through the work of Bayley (1933), Cattell (1940), and Frankenburg and Dodds (1969) provide the basis for the delineation of the early motor skills in the various instruments mentioned above. In addition, a cumulative effect is observed, i.e., the more recently published works now include the forerunners in this field as references. Haring and Cohen (1975) in a review of curricula for severely/profoundly handicapped persons site the following rationale for the developmental approach:

> 1. The developmental approach serves as a uniform basis for arranging experiences at least for the first 72 months of development. We believe that once a child has reached a developmental age of 72 months, he can no longer be considered <u>severely</u> handicapped.
>
> 2. The developmental approach is based upon an observed record of many children from many cultures developing from birth to early childhood; therefore, arranged experiences and interventions on the basis of the sequence typically followed by developing children have a certain logic.
>
> 3. The developmental approach serves as the basis for treatment by several other management disciplines, such as child development specialists, communication disorders specialists, nurses, occupational therapists, and pediatricians. This, of course, increases communication among the disciplines and provides a common basis among disciplines for measuring the child's progress (p. 44).

There is little variability noted in the number and type of motor development items in the majority of the assessments but the format or

mode of presentation may vary. The Portage Project (Shearer et al., Note 2), Learning Accomplishment Profile (Sanford, 1975), and Marshalltown Project (Reisler et al., Note 1) present a hierarchy of developmental skills, drawn from normative data, as the basis for an evaluation of the child's existing skills. Fine and gross motor skills are combined under one motor heading in the Portage Project and are presented sequentially by years, i.e., 0-1, 1-2, etc. Fine and gross motor skills are considered separately in the Learning Accomplishment Profile and are sequenced by months with behaviors listed for one month of age, two months and so on throughout the first year followed by larger increments as chronological age progresses.

The Minimum Objective System for Pupils with Severe Handicaps (Williams & Fox, Note 3) sequences selected classes of behaviors such as sitting, standing and walking on the basis of normal development to decrease the difficulty in tracking one behavior or class of behaviors through the sequence when assessing a pupil and developing a training program. Similarily, the Developmental Pinpoints (Cohen et al., 1976) is designed to provide information concerning major developmental areas, and on the pattern of development of discrete skills. As the term "pinpoint" refers to a measurable behavior, the emphasis throughout the listing is on that which is observable (Cohen et al., 1976). Developmental Pinpoints adapts the developmental skills listed in existing scales and arranges them in a format which tracks each skill over time rather than following the chronological appearance of skill clusters. Pinpoints are arranged in two general categories: eye readiness and movements involving

hands. Gross Motor pinpoints are arranged in general categories: static balance, dynamic balance within basic movement patterns, and coordinated movements.

Mira (1977) observes that these sequential checklists of motor development pinpoints represent the starting point from which to develop a tracking system for the multiply handicapped infant; they provide suggestions for the small behavioral steps that are necessary. They are not sufficient as a monitoring system, however, since they were designed to provide information on the skills that existed prior to intervention, and to identify the appropriate starting point for intervention. Checklist comparisons do not provide information about rate of acquisition and how the emergence of one skill is influenced by the acquisition of other behaviors. Roberts, Bundy, Mira, and Cairns (1978) note that while scales based on the presence/absence strategy yield information about the average age of onset of a behavior and the relative developmental status of an individual infant within his age group; they do not yield complete sequential information about the development of particular response classes. In several articles and chapters Horowitz (1965; 1968; 1969; and 1976) has also discussed the possibility that developmental outcome may partially depend on how successfully the infant's behavior elicits environmental stimulation and how successful contingent environmental stimulation is in providing reinforcement for the infant's behavior. The checklists, assessments and accompanying curricula rarely address environmental adaptations that may facilitate a partial or total response to the developmental item by the infant/child with a

moderate to severe neuromotor disability. Strict adherence to a developmental model may impede progress toward skill acquisition in a population whose movement patterns are so atypical. Extraneous movement (chorea, athetosis, ballesmus) may be inadvertently reinforced in a fine motor program that does not consider positioning of the youngster or placement of the stimulus object. Clinical experience with infants and young children demonstrating severe neuro-motor disabilities in a demonstration classroom has suggested the effectiveness of alternative sequence for the development and refinement of reach-touch, reach-grasp responses.

The adaptations involved in developing the sequence were based on the premise that reach-grasp-release patterns are critical skills (i.e., pre-requisites) to a number of more complex, coordinated skills that cross areas of development. This in conjunction with an understanding of the effects certain primitive reflex patterns impose on the posture of the infant yielded a sequence of steps that facilitated the emergence of these responses. Once the skill is acquired, a developmental model provides a framework for further refinement.

Alteration or adaptation of a developmental sequence assumes a firm background in normal child development and the neurophysiological responses that are precursors of the major milestones. The intent is to utilize available sources to identify motor behaviors or pinpoints critical to the acquisition of skills across areas of development rather than to define a new sequence or to devise still another checklist. Equally important is the maintenance over time of quantitative data on individual children to develop a base of information regarding the course of development in the severely/multiply handicapped.

Quantitative Measurement of Motor Development in Infants and Young Children

Given the limitations of traditional assessment instruments and scales for measuring acquisition of motor skills by infants and young children, some investigators have directed their attention toward the development of more precise and sensitive quantitative measurement procedures.

For instance, Edwards and Edwards (1970, Note 4; Note 5), have argued for a system to record dynamic developmental changes that distinguish the target behavior from other behaviors and charting the rate of occurrence. According to Edwards and Edwards (1969a):

> These two dimensions of behavior development provide a basis for the longitudinal assessment of the development of a single child as well as the isolation of differences in the level of development between 1) an individual child and others his age, 2) children at different age levels, and 3) normal and handicapped children either of the same or different ages (p. 3).

Methods described by Edwards and Edwards (Note 4; Note 5) have included longitudinal measures of both the rate and duration of identified behavior observed in natural settings (usually free play settings in the child's home). In one study (Note 4) Edwards and Edwards used these longitudinal observation procedures to record the development of motor, social, play, and language skills among eleven normal children ranging in age from three to fifty-nine months. Specific motor skills observed and recorded were sit, hold, stand, free stand, creep, hold steps, free steps, pick up object, and place object in mouth. Other behavior

recorded included smile, laugh, look at person, cry, whine, babble, and word use. The longitudinal records were sensitive to the emergence and development of new behavior, the decay of early forms of behavior, typical rate levels of behavior, and across age comparisons.

In subsequent study, Edwards and Edwards (Note 5) used the same longitudinal rate recording procedures to study the motor, social, play, and language development of four normal and two moderately handicapped children (ages 12 and 15 months). Results of the study indicated the recording and charting procedures were sensitive to acceleration of some behavior as a function of using a walker, and the temporary deceleration of some behaviors as a result of illness.

In another study involving continuous measurement over time, Roberts et al. (1978) reported the use of an event recorder to measure changes in frequency and duration of three motor responses in two infants. Chin lifting, chest lifting, and movement to a hand or knee position were recorded when the infants were placed in a prone position. Results showed similar patterns of development between the two infants as well as the behavioral changes across the three motor responses observed. Interestingly, the relationship between response frequency and duration were not consistent across behaviors. There was an inverse relationship between the two measures for chest lifting, following an initial period of positive covariance. According to the authors, "The significant practical applications of this strategy derive from its sensitivity to behavior change in infancy and its ability to detect changes in the course of development at the time that these changes are occurring" (p. 13). The

authors also pointed out that diminishing accelerations of emerging behavior may indicate developmental disabilities or the adverse effects of damaging environmental conditions.

While Roberts et al. (1978) used an event recorder for continuous measurement of three motor responses, it should be noted that Boer (1968) used a stenograph machine accompanied by one-second audible beats from a metronome to record frequency of selected motor and object manipulation behavior in preschool autistic children. Seth (1973) utilized film records of infants to derive frequency measures of visual-motor performance in the attempt to assess developmental trends. Quantitative measures of several visual-motor skills were obtained (e.g., duration of attention to objects, reaching towards an object).

Applications of Quantifiable Measurement Procedures to the Severely/Multiply Handicapped

Longitudinal, quantitative measures of motor and sensory/motor development among severely and multiply handicapped infants and young children are necessary for early intervention efforts. Haring (1976) noted that methods to assess "fine focus" behaviors are needed so that tiny lags in development can be treated immediately. Yet, there are few published reports of results or efforts to utilize precision measurement techniques with the motor and perceptual/motor development of severely and multiply handicapped children.

Mira (1977) describes a project that has utilized a fine grained analysis to measure intervention programs with multi-handicapped infants.

The developmental goals for intervention programs with seven infants include postural control, body mobility, and functional hand use. Mira reports that the records obtained include very sensitive measures of child change allowing therapists to quickly assess the effectiveness of the treatment programs and to evaluate the childs current health status. Mira concluded:

> Continuously monitored behavioral development expressed as frequency of occurrence of targeted skills is a very promising basis for therapeutic decision making in the early intervention with multi-handicapped children. It is thus a tactic as well for demonstrating program effectiveness, and therefore, has value in meeting the requirements of program accountability" (p. 36).

Haring (1976) has also described initial efforts to develop a "fine focus" sequence for the infant program at the Unversity of Washington. Specifically, the problem of sitting is being measured by tracing a silhouette of the infant on a marked grid, thus allowing precision measurement of the angle of the infant's neck and the relative roundness of the back. This graphic visual display allows the therapist to prescribe week-by-week exercises.

In summary, although the initial attempts to develop quantifiable and continuous measurement procedures for assessing the motor acquisition of severely and multiply handicapped infants are very promising they are, at present, far too limited. Certainly the preliminary studies by Edwards and Edwards (Note 4, Note 5) with normal and moderate handicapped infants are central to the development of this technology. Equally important is the more recent work by Mira (1977) and her colleagues

at the University of Kansas Medical Center, that has extended the measurement system to infants with multiple handicaps. Although, it is surprising that more systematic attempts to develop and analyze the fine grain motor and perceptual/motor behavior of handicapped infant and children have not been done, this may reflect the relatively recent interest in providing services to the severely/multiply handicapped child, the even more recent emphasis on early childhood education with this population of children, and the traditional preoccupation with designing and developing "checklist" types of measurement devices.

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